



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IX

75 Hawthorne Street

San Francisco, CA 94105

December 21, 2016

Mr. Anthony R. Brown
Environmental Manager
Atlantic Richfield Company
4 Centerpointe Drive, LPR 4-435
La Palma, CA 90623-1066

Re: EPA comments on Atlantic Richfield's Interim Combined Acid Drainage Treatability Investigation Report, Leviathan Mine Site, Alpine County, California dated December 18, 2015.

Dear Mr. Brown,

EPA has completed its review of Interim Combined Acid Drainage Treatability Investigation Report, Leviathan Mine Site, Alpine County, California dated December 18, 2015; Leviathan Mine Site, Alpine County, California. This work was submitted as part of the Scope of Work for completing the remedial investigation and feasibility study to identify a long term remedy pursuant to Administrative Order for Remedial Investigation and Feasibility Study (RI/FS), Leviathan Mine, Alpine County, California (CERCLA Docket No. 2008-18, June 23, 2008).

The report describes results of bench- and pilot-scale treatability studies, and full-scale capacity testing conducted during 2014 to evaluate the feasibility and effectiveness of high density sludge (HDS) treatment technology to treat combined flows from at least four of the five primary acid drainage (AD) discharges at the Leviathan Mine Site (site) in Alpine County, California.

Background: Since 2001 ARC and the Regional Board have conducted seasonal early response actions at Leviathan Mine. The Regional Board collects acid drainage from the Adit and Pit Underdrain (PUD) in Ponds 1, 2N, and 2S. During normal or dry water years, the ponds provide sufficient capacity to store the acid drainage until mid-July when the water is treated and discharged. During wet years such as occurred during 2004-2005, 2005-2006, and 2010-2011, the ponds threaten to overflow before the existing pond water treatment system can be operated, and early season treatment is necessary to prevent pond water discharge to Leviathan Creek.

ARC mobilizes to the site and intercepts the Channel Underdrain (CUD) and part of the Delta Seep (DS) discharge, conveys the intercepted water to Pond 4, and treats the water in an HDS plant prior to discharge. The HDS plant typically operates from late May to late October.

ARC desires to collect and treat combined acid drainage from the Adit, PUD, CUD, and DS at the HDS Plant. To assess the capability of the HDS Plant to treat these combined flows, ARC submitted an Interim Combined Acid Drainage Treatability Investigation Work Plan to EPA on June 18, 2014. The work plan was approved by EPA on October 14, 2014. ARC completed the bench scale pilot test, and provided a report on December 18, 2015. EPA provided a partial approval of ARC's proposal on March 14, 2016.

The partial approval was for construction of the interim combined treatment (ICT) conveyance system and controls, and completion of the treatability study recommended in the report. EPA clarified:

"This approval also notes that, while conducting ICT trials is a desirable step toward identifying an option for a long term remedy at the site, many of the design criteria in this report are not necessarily appropriate or approved for use in remedy selection and design.

EPA understands approval to being planning for construction season logistics is needed at this time so Atlantic Richfield may proceed this year. Please note EPA's concurrence with the Attachments (particularly Attachments B, C and D) is pending detailed review by EPA."

EPA has completed its detailed review of the December 18, 2015 submittal and provides the following General and Specific comments.

General Comments:

G1: Treatability Vs. Final Design: ARC's ICT Report states that *"Treatability testing was not conducted to determine the feasibility of using the current HDS Treatment System and ponds under all potential treatment conditions that may be evaluated in selecting the final preferred remedial alternative for the site"* (Page 7, Section 3.0 Objectives, first paragraph). Based on this statement, EPA considers the ICT report as describing studies undertaken to determine if the ongoing early response actions (ERA) could be modified so that combined influent originating at the Adit, PUD, CUD, and DS could be successfully treated using the existing high density sludge (HDS) plant at Pond 4 during typical treatment season flow and chemistry conditions. Any proposed modifications to the current early response action systems must explicitly address concerns regarding system sizing and contingency for wet years such as those that occurred during 2004-2005, 2005-2006, and 2010-2011. These concerns are outlined in greater detail in the specific comments below.

For purposes of completing the Feasibility Study, ARC shall ensure that the information summarized in the ICT report and any necessary information resulting from implementation of ICT is completed in time, and used to inform the FS in support of evaluating final remedies.

- **G2: Actual Site Conditions and Full Analysis of the Capacity to Treat Expected Influent Water.** Please provide a full analysis of the typical spring season influent water expected at the site. EPA has prepared Table 1 below to compare the data assumptions for expected acidity, dissolved total iron, ferrous iron, and sulfate concentrations. The table compares the concentrations of acid drainage treated from the upper ponds during 2006 to the concentrations in Phase IIA, Phase IIB, and the proposed 85th percentile shortened season. The comparison shows that the upper ponds contain significantly more acidity, total iron, ferrous iron, and sulfate than the water ARC has evaluated in the ICT report.

Table 1: Comparison of expected chemical conditions

	Phase IIA ⁴	Phase IIB ⁶	85 th shortened ¹	May 2006 ⁷
Acidity	3,300	3,800	2,900	5,000
Dissolved total Fe (mg/L)	650	490	610	1,100
Ferrous Fe (mg/L)	2 ⁵	20	480	900
Sulfate (mg/L)	5,000	5,300	3,300	6,380
Influent Flow (gpm)	NA	NA	143	111 ²
Sludge Recycle rate (gpm)	NA	NA	35	27 ³
Total Flow within HDS Plant	NA	NA	178	138

Notes:

1 = Table 6 of ARC's ICT report; dated December 18, 2016; calculated by ARC; per an 85th percentile water year.

2 = Average flow rate necessary to prevent pond overflow during 2011 Spring season

3 = Estimated from values in Table 7 of of ARC's ICT report; dated December 18, 2016

4 = From Table 5 of ARC's ICT report; dated December 18, 2016. This is the one was abandoned; required too much lime.

5 = From Table 5 of Attachment C of ARC's ICT report; dated December 18, 2016

6 = From Table 11 of Attachment C of ARC's ICT report; dated December 18, 2016; more dilute

7 = May 2006 data are from Appendix C of the Regional Board's 2006 Annual Report. Actual results.

EPA provides these additional specific comments:

- S1: Volume of Water.** The volume of water seems to be underestimated. EPA does not agree that ARC's system designed to accommodate flows only through the 85th percentile water year, (which ensures a 15% failure rate) is sufficient for representing future design. Please review, revise and provide supporting documentation of the anticipated volume of water for treatment. ARC's 85th percentile water year underestimates the volume of water to be reasonably expected. ARC's report anticipates a maximum treatment volume of 27.2 million gallons (Mgal). Whereas, 31.8 Mgal of water were treated during 2011 and 24.4 Mgal of water were treated during 2006 without capture and treatment of the DS. With collection of the DS, it is likely that the ARC's proposal would have failed to treat some of the acid drainage during 2006. Therefore, use of the HDS Plant to treat the combined flows would result in a known failure rate of at least 2 out of 15 years, or 13 percent. Please review, revise and provide supporting documentation of a treatment system that can support the anticipated volume of water capacity during wet years.
- S2: Treatment Period.** Please revise the assumptions for the treatment period necessary to ensure there is no discharge of untreated acid drainage. ARC's report assumes the spring season treatment period begins on May 1st. However, treatment start times have varied. Start times for 2005, 2006, and 2011 were late May, April 14 (the ponds spilled), and April 5 respectively. Start times are driven by the need to ensure that water from Ponds 1, 2N and 2S are treated to prevent a discharge of untreated acid drainage. It is likely that an early to mid-April treatment start date will be necessary at least 13% of the time. See comment S1 above. ARC's ability to achieve their stated goal of 90% up-time during early to mid-April conditions is questionable given the history

of poor site access during April, and the likelihood the system will need to operate under low temperature conditions.

Typically, ARC has stopped treatment at the HDS plant no later than mid-November. Historically, the mean temperatures at Monitor Pass are similar in April and November. Thus, the ability to continuously operate the HDS Plant through April and into early May is doubtful. Low temperatures have been cited by ARC as posing a threat of significant damage to the HDS Plant, and as rendering reliable capture of the CUD and DS impractical.

Please provide a more complete evaluation of the treatment period and ensure that the use of the HDS plant alone, will prevent discharge of untreated pond water during an 85th percentile or wetter year. Given that the data collected from this on-going pilot treatability study is anticipated for use in the Feasibility Study and selection of alternatives. Please provide a review, study, and explanation that ensures anticipated ARAR's will be met. i.e. no releases that cause an exceedance of the Basin Plan for Leviathan creek.

- **S3: Operation Time during the Treatment Period.** ARC's data indicates that the HDS treatment plant would need to function continuously for at least 90 percent of the treatment period (90% up time). The HDS Plant has achieved 90 percent or more up time since 2008; however, there was adequate storage within Pond 4 to continue to receive and store captured water while the HDS plant was not discharging (i.e. because of low influent flows, or other various process alarm conditions). Further, it is important to note, that the high operation times occurred under low to average flow conditions with relatively dilute waters from the CUD and DS.

ARC's treatability study focuses on treatment of pond water chemistry from July and August of 2006 *after* blending with CUD and DS waters. ARC must consider and analyze data from a wet year in April or May, when the influent water contains significantly more acidity, dissolved total iron, ferrous iron, and sulfate. To fully assess, it is essential that ARC's analysis assume influent flows will be at their highest and there will be no available excess storage capacity in the pond system. Under these conditions, operation times over the treatment period may be limited by scaling and lime consumption needs.

- **Scaling.** EPA notes that ARC's Phase IIB treatability study encountered downtime due to scaling issues. As noted above, when the pond water during April / May has elevated ferrous iron (at least 400 times the concentration used in Phase IIA) it will dramatically increase the associated scaling issues. Please provide additional detail and revise to ensure that the HDS plant will achieve the necessary 90 percent operation time; particularly during April and May of a wet year. Given that the data collected from this on-going pilot treatability study is anticipated for use in the Feasibility Study and selection of alternatives; the design requirements should be such that ARAR's will be met. i.e. no releases that cause an exceedance of the Basin Plan for Leviathan creek.
- - **Lime Consumption:** EPA notes that ARC's Phase IIA treatability study was abandoned when it encountered a greater than expected lime demand. The influent (59% Pond 2S water and 41% Pond 4 water) was closest to (and more dilute than) the high acidity and high ferrous iron water treated from the upper ponds during 2006. It should be noted that if the pilot could not handle this mix, it is likely it would not handle the upper pond water during a wet year--which is more highly contaminated. Particularly, when the pond water

during April / May has elevated concentrations and volumes, there will be a large increase in lime consumption. Please provide additional detail and revise to ensure that the HDS plant will achieve the necessary operation time; particularly during April and May of a wet year. Given that the data collected from this on-going pilot treatability study is anticipated for use in the Feasibility Study and selection of alternatives; assumptions should be sufficient to ensure that ARAR's will be met. i.e. meet water basin standards at all times.

- **S4: Hydraulic Retention Time** Please provide additional detail and supporting documentation to ensure successful treatment using a flow rate of 138 gpm and a residence time of 45 minutes. Section 6.2.1 states that a 30-minute retention time is recommended for adequate lime neutralization. Successful treatment is also contingent on oxidation of the ferrous iron. If the iron is not completely oxidized, an increased residence time would likely be necessary to successfully treat the water. Using the influent ferrous iron concentrations encountered during 2006, a constant aeration volume of 34 cfm is needed to ensure oxidation of the ferrous iron alone. The significantly higher ferrous iron concentrations are expected to require an increased hydraulic retention time during a period of high flow. The excess acidity created by the oxidation and precipitation of the ferrous iron will also increase the lime demand. Please modify the report to assume an increased retention time to ensure: oxidation of the ferrous iron, time for neutralization to occur, and increased settling time required to remove the increased quantity of precipitates. Please provide additional detail and supporting documentation to ensure successful treatment using a flow rate of 138 gpm and a residence time of 45 minutes during treatment of Adit and PUD water similar to the water treated during spring of 2006.
- **S5: Contingency Plans** The text in Section 5.3 notes that contingencies might be necessary. Please include a full description of specific and implementable alternatives to back up the ICT. For example, what is the contingency if the ICT does not provide adequate treatment capacity to prevent discharge of pond water. A contingency measure is necessary to prevent discharge of untreated mine drainage during the spring season peak flows, particularly in wet water years similar to 2006 and 2011. i.e. Rotating Cylinder Treatment System has been used to successfully treat the upper pond water during prior wet years
- **S6: System Wide Scale Accumulation.** ARC assessed scale accumulation for the reactor tank, clarifier, and lime/sludge mix tank. Section 6.7 also describes possible remedies for occurrence of scale at the reactor overflow pipe, clarifier overflow pipe, during sludge handling, and discharge piping to Leviathan Creek. During seasonal HDS operation scale has also been encountered in conveyance pipes. For example: at the CUD, Pond 4, and the HDS intake. The proposed ICT will contain at least ten times more ferrous iron, aluminum, sulfate, and acidity than water treated during recent years. Therefore, ARC must provide a full evaluation of the scaling potential, including an assessment of the conveyance and HDS intake. Please also identify steps necessary to ensure that accumulation of scale does not interfere with treatment operation. See also Comment S2 above.
- **S7: Schedule:** Please provide a schedule that incorporates this work into the final and complete RI/FS schedule/ Gantt Chart. EPA provides comments on the RI/FS schedule under separate cover. This ICT work should be completed sufficiently in time to provide information necessary to complete the RI/FS per the EPA approved schedule. EPA is not opposed to work for refining the proposed or selected long term remedy.

Within 30 days, or by January 20, 2017, please provide a written response to these comments with the additional detail requested. In particular, please provide the additional chemistry, volumes and calculations to support the ARC proposed Combined Acid Drainage Treatability Investigation.

If you have any questions, please feel free to contact me at (415) 947-4183 or Deschambault.lynda@epa.gov.

Sincerely,

A handwritten signature in dark ink that reads "Lynda Deschambault". The signature is written in a cursive, flowing style.

Lynda Deschambault
Remedial Project Manager

Cc by electronic Email:

Douglas Carey, California Regional Water Quality Control Board, Lahontan Region
Neil Mortimer, Washoe Tribe of Nevada and California
David Friedman, Nevada Department of Environmental Protection
Kenneth Maas, United States Forest Service
McBride, United States Fish and Wildlife Service
Steve Hampton, California Department of Fish and Wildlife
Marc Lombardi, AMEC